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Determination of toxic elements (Pb, Hg, Cd, As) and fatty acids in muscles and cephalothoraxes in a Mediterranean and a northern rose shrimp: a comparative study of *Parapenaeus longirostris* and *Pandalus borealis*.

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Abstract

Parapenaeus longirostris (deep-seawater rose shrimp) and *Pandalus borealis* (northern shrimp) are two species found in the deep waters (>50m) of the Mediterranean and northeast Atlantic sea, respectively. The aim of the present work was to observe whether these species are suitable for human consumption in terms of toxicology and also whether the fatty acid component of total lipids (TL) are in desirable nutrition levels.

Inductively Coupled Plasma Mass Spectrometry (ICP-MS) was used for the analysis of Pb, As and Cd and Cold Vapour Atomic Fluoresence Spectrometry (CVAFS) for Hg. All elements were found in higher levels in cephalothoraxes (head including hepathopancreas) compared to muscles in both shrimp types. Pb and Hg were found in higher levels in muscles and cephalothoraxes of the Mediterranean shrimp in comparison with the northern shrimp. Nevertheless, both contained much lower concentrations than the maximum limits given by the European legislation (0.5 mg/kg for both elements) which is also the limit for Cd that was not exceeded in this study. .. In contrast there is no regulatory limit yet for As, but the Environmental Protection Agency (US EPA) and the World Health Organization (WHO) provide consumption advisories such as reference dose, tolerable intake etc.. Noticeably, the levels of total As were more than twice as high in the muscles of northern shrimp.

Furthermore, the fat content of these species was determined by Bligh-Dyer extraction followed by GC-FID. The cephalothoraxes contained about 5% of TL, while the muscles contained only 1% of TL in both species. Polyunsaturated fatty acids (PUFA) were the major fatty acids at a range of 34-42% in the tissues of the Mediterranean shrimp. In the northern shrimp, PUFA were the major fatty acids only in muscles, while in cephalothoraxes monounsaturated fatty acids (MUFA) were predominant (52%). The saturated fatty acids (SFA) varied between 14.6 and 25% of TL in both species. Among the unsaturated fatty acids, C20:5 ω-3 (EPA /eicosapentaenoic), C22:6ω-3 (DHA /docosahexaenoic) and C18:1 ω-9 (oleic acid) and among the saturated fatty acids C16:0 (palmitic acid) were the most dominant in all tissues. The significant differences were probably due to the native habitats and the trophic characteristics of the seas.

In conclusion, both species were considered as suitable of consuming (low fat, rich in fatty acids, low levels of heavy metals). Cephalothoraxes could potentially be used by pharmaceutical industries as a marine source for the production of food supplements.

Keywords: Shrimps; Mediterranean sea; Atlantic sea; heavy metals, fatty acids.